

PSoC

User's Manual

May 2003.



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CONNECTING THE SYSTEM

The development system box contains the development system, CD and a serial cable.

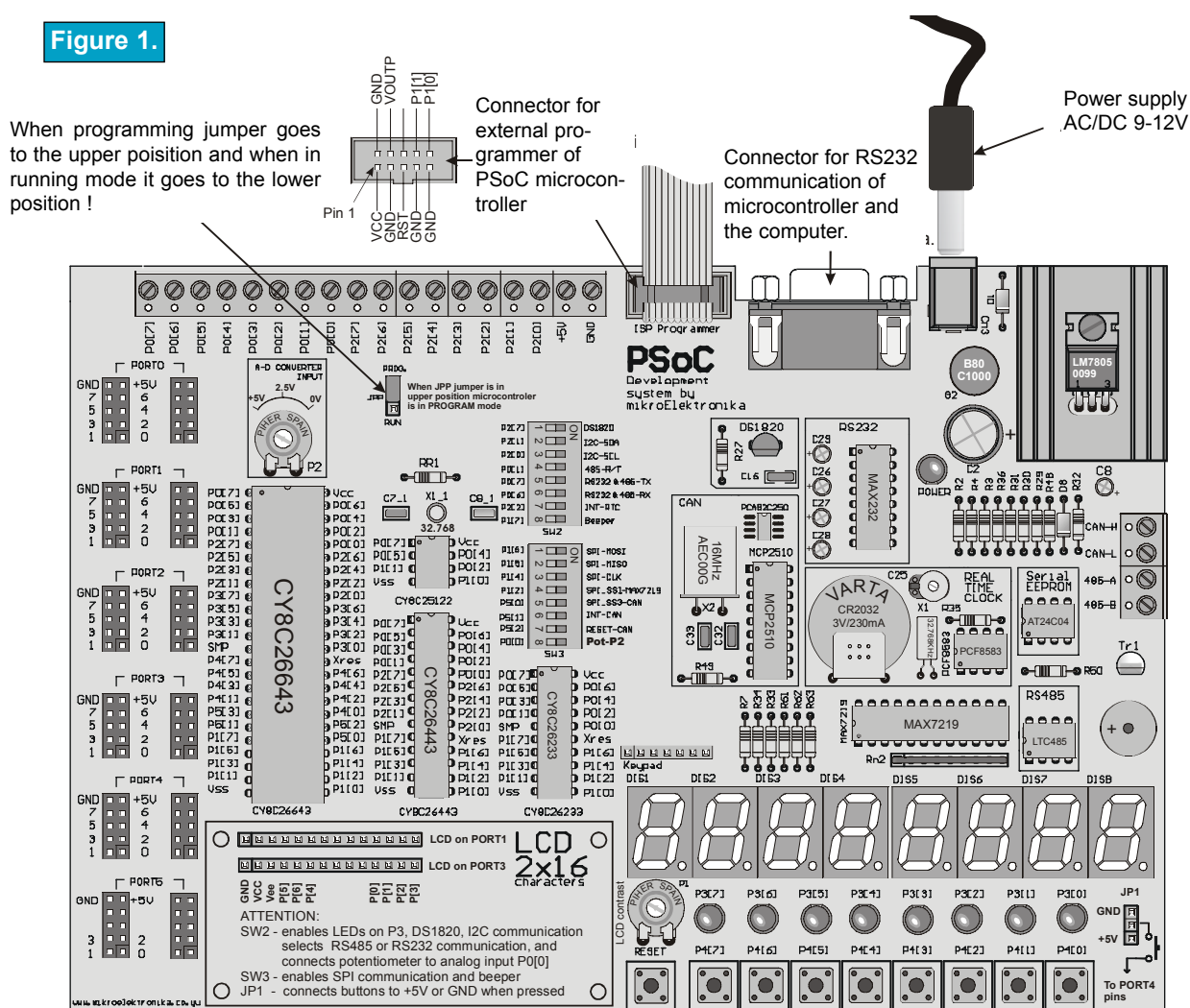
NOTE: Jumper JPP has to be in the upper position when you work with the development system. It should be set to the lower position only when the development system is used in certain applications when the programmer is no longer needed.

Step no.1 The first thing to do is to take the system out of a box and to connect the PSoC programmer to the development system, using the flat cable. Connect one end of the parallel cable to the parallel port of the computer, and its other end to the PSoC programmer.

Step no.2 Second step is to connect the power supply. It can be AC or DC, as desired, and the voltage should be between 9V and 12 V. The figure below illustrates the first contact with the development system.

Step no.3 Install the PSoC prog software.

Figure 1.



DESCRIPTION OF THE DEVELOPMENT SYSTEM

POWER SUPPLY AND THE RESET CIRCUIT

For all the elements in the development system to work properly, it is required to have stabilized +5V. With PSoC system, it is achieved by using the power stabilizer LM7805. Because of the increased dissipation which occurs at higher current consumption, stabilizer is set upon the appropriate cooler. Diode POWER indicates that the power is on.

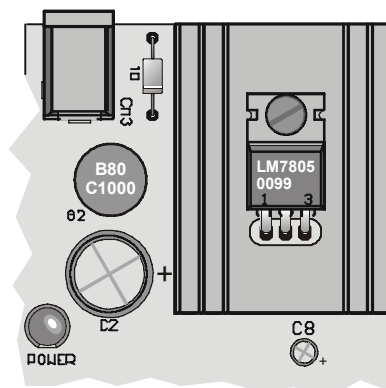
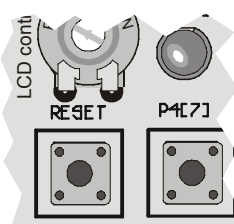
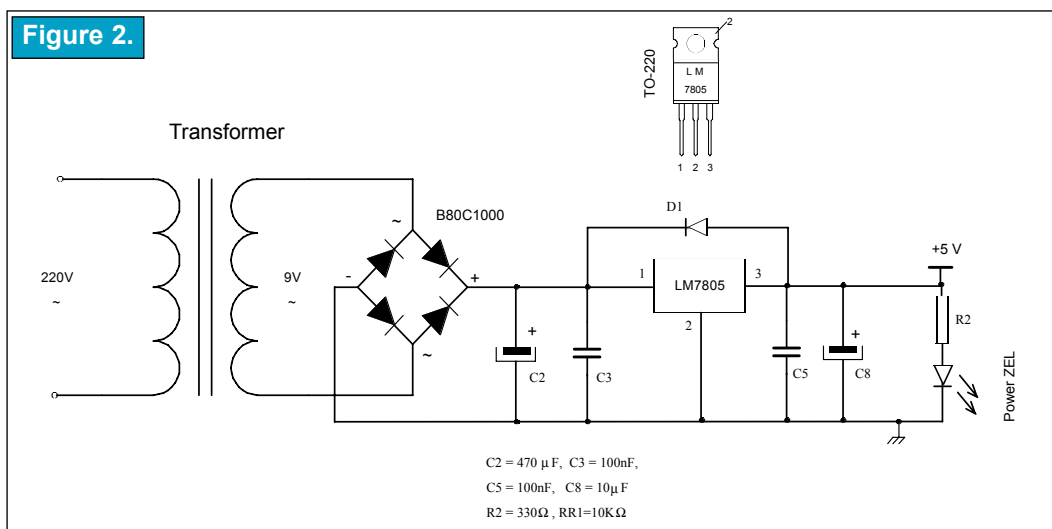
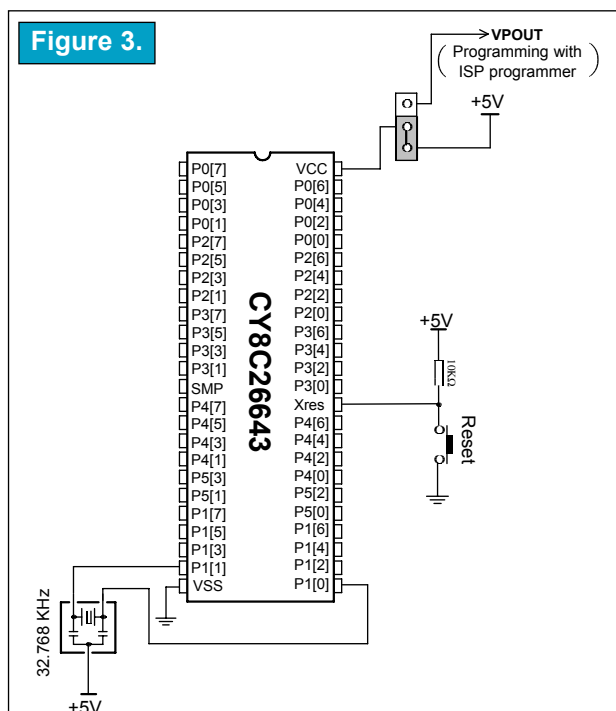


Figure 2.



When testing, it is often necessary to reset the microcontroller. The button RESET on the PSoC development system is used for this purpose. The scheme of reset button and microcontroller connection is on figure 3.

Figure 3.



SWITCHES AND THEIR PURPOSE

The purpose of DIP switches on the system is to establish or break the connections between the microcontroller and the development system peripherals. DIP switches divide into two groups: **SW2** and **SW3**.

The first group, **SW2**, connects microcontroller I/O lines to the digital thermometer, I2C bus, serial RS-232 and RS-485 communication circuits and the mini speaker.

The second group, **SW3**, connects the appropriate microcontroller pins to SPI communication bus, driver MAX7219 for 7-segment LED display, CAN communication lines and the potentiometer P2, whose voltage can be read thanks to the internal A/D converter.

The following tables symbolically display the organization of DIP switches.

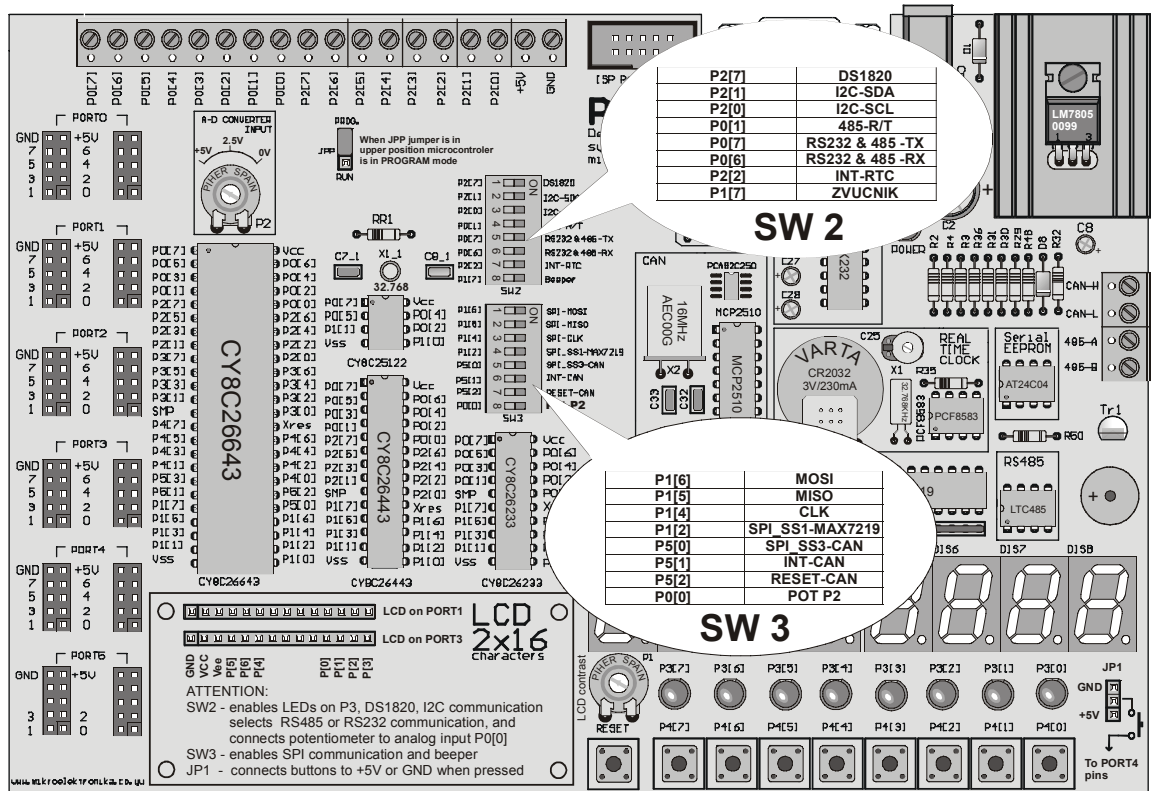
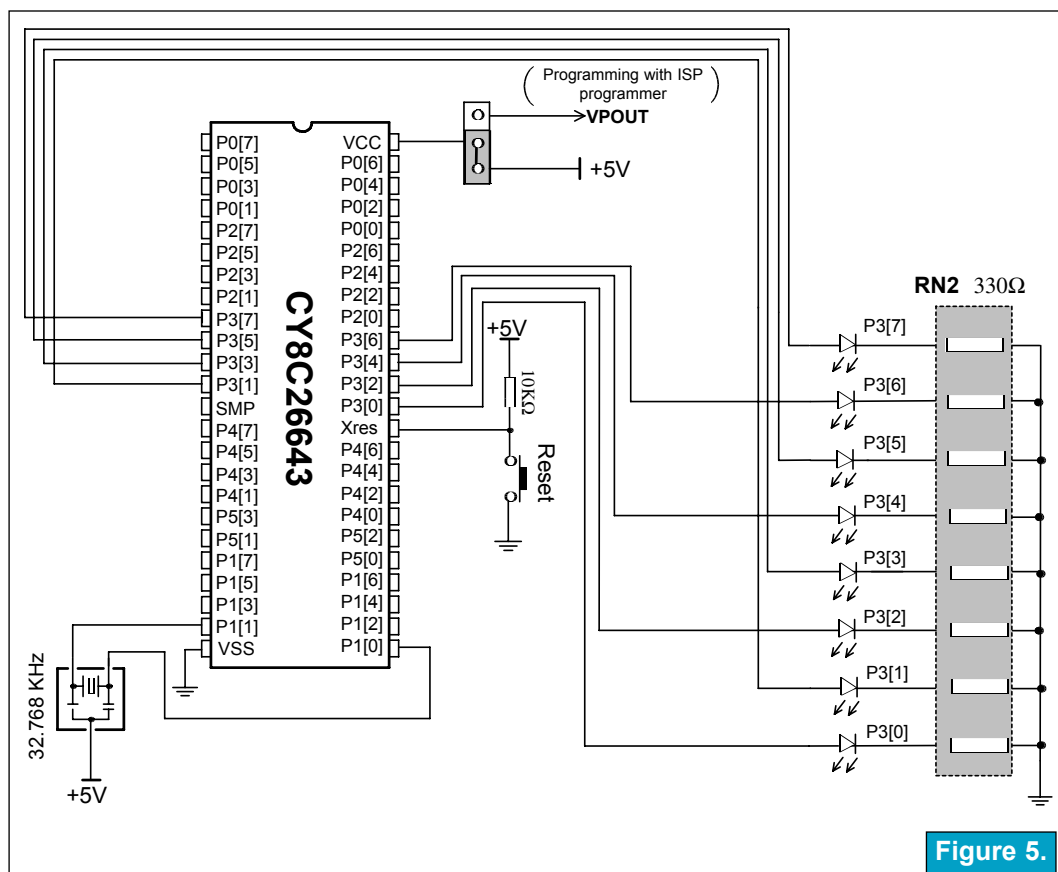
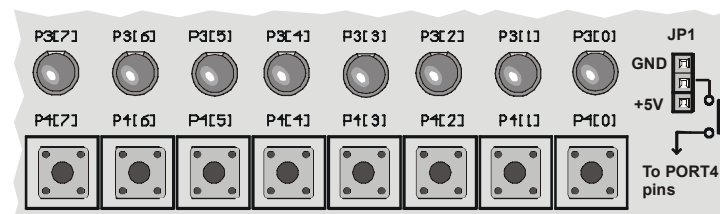


Figure 4.

LED DIODES

The system has 8 diodes that are connected to the appropriate microcontroller via port 3. These diodes are ordinarily used in the first phase of the work, but they are also used for the later indications of the program flow. Diodes' looks is given on the figure below. The way to connect the LED diodes to the microcontroller is shown on the figure 5.



NOTE: LED diodes are switched on by logical one. It means that the microcontroller must have a logical one on a pin for diode to emit light.

PUSH BUTTONS

System features one RESET button and 8 buttons for simulating the system command inputs. Graphic scheme of the buttons-controller connection via port 4 is on the figure 6. Depending on jumper **JP1** setting, pressing the button will set either logical zero or logical one on the appropriate pin. In the example shown on the following figure, buttons are connected to +5V via jumper **JP1**.

NOTE: Keyboard and the buttons cannot be used simultaneously !

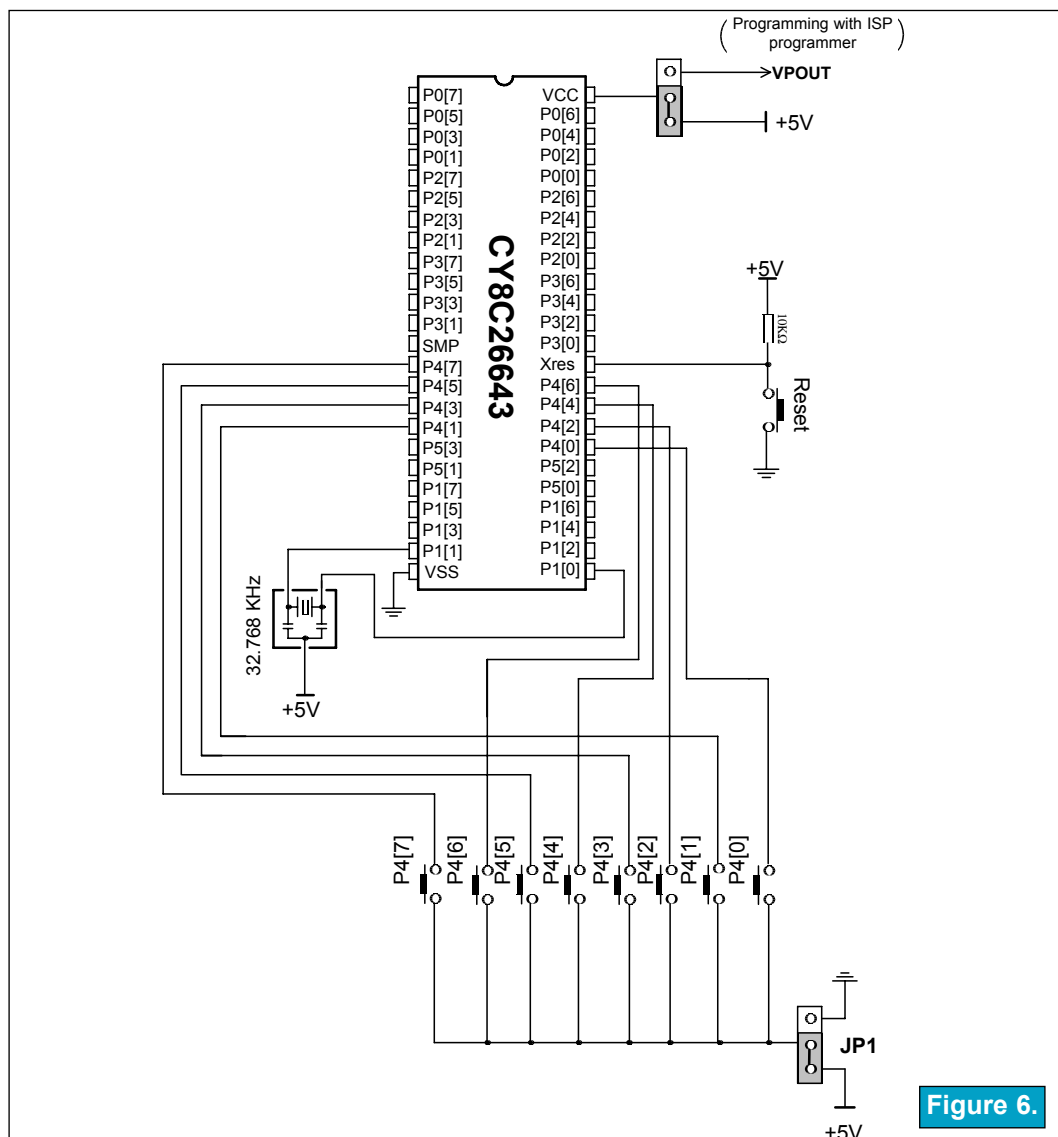
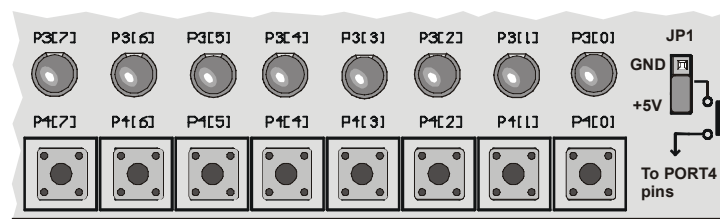
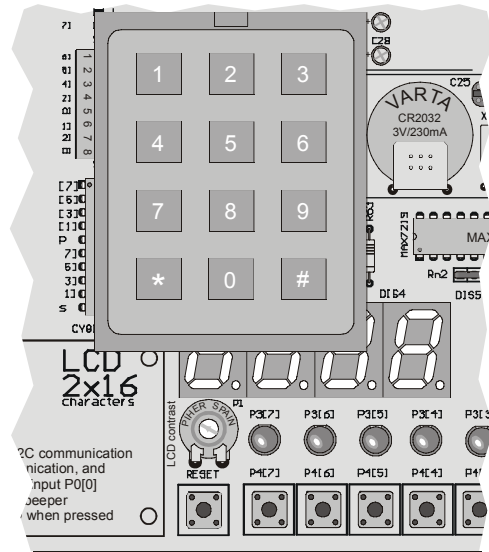


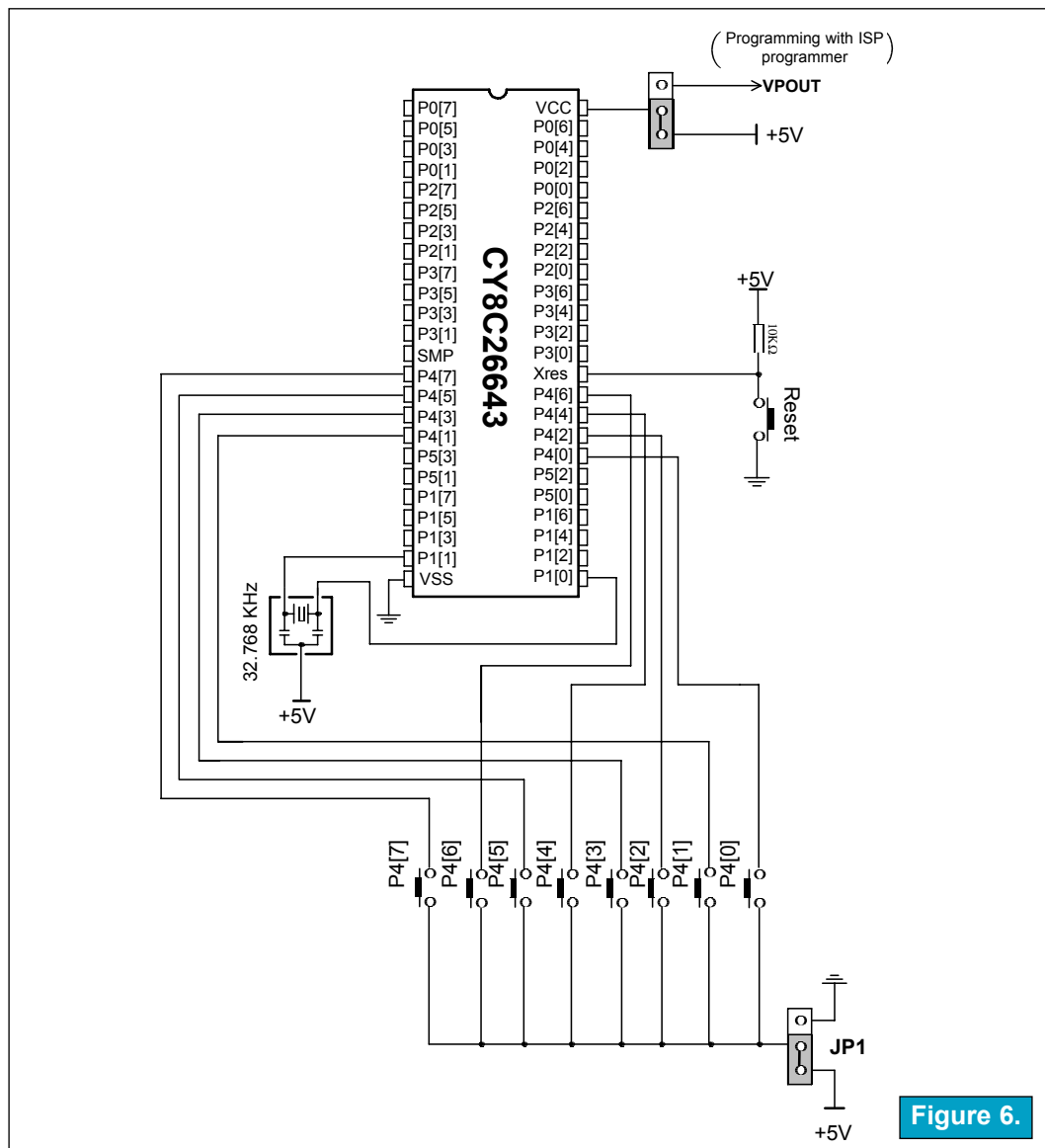
Figure 6.

4X3 MATRIX KEYBOARD

4x3 matrix keyboard is very suitable in occasions when 8 buttons are insufficient. The keyboard connects to the pins of port 4 in same way as the buttons.



NOTE: Keyboard and the buttons cannot be used simultaneously !



LCD DISPLAY

Standard LCD display (2x16 characters) is supplied. However, this is not a limitation, because any display, having the same type of communication with the microcontroller, can be used. Display contrast can be adjusted using the potentiometer placed to the right of the LCD display. The following figure shows how to connect LCD to port 1 of microcontroller CY8C26643. LCD may be also connected to port 3.

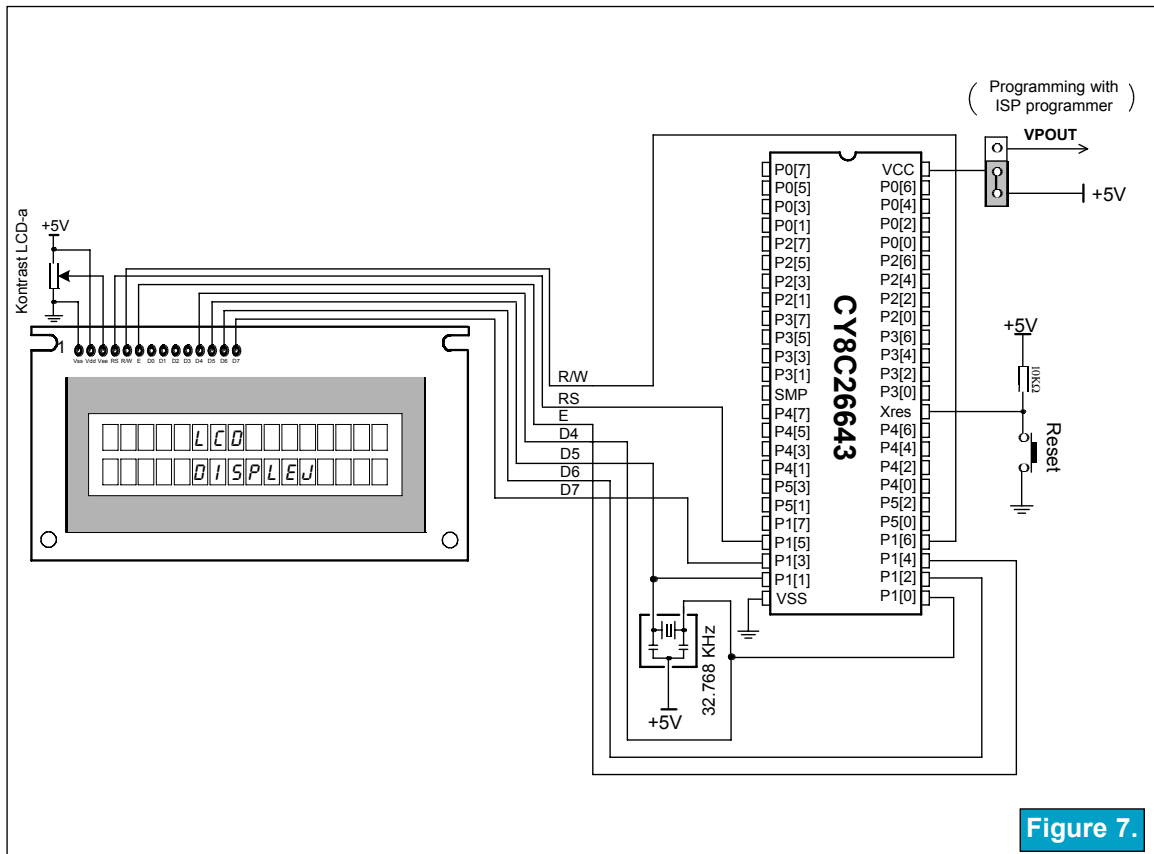
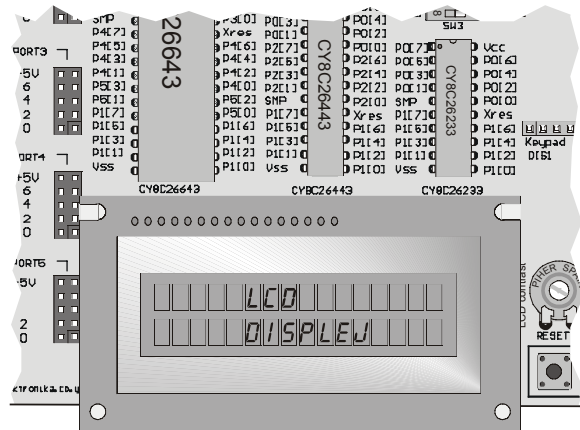
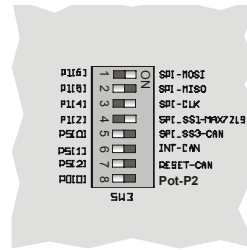


Figure 7.

7-SEGMENT DISPLAY

7-segment display consists of 8 digits that print values and are refreshed by the driver MAX7219. Value of each digit is inputted serially via pins MOSI, SCK and CS3 of the appropriate microcontroller, hence the switches have to be set as shown on the figures below. LED display's looks is given on the picture below, and the figure 8 shows how to connect 7-segment display to the microcontroller.



It is necessary to have all three switches (1, 3 and 4) ON for 7-segment display

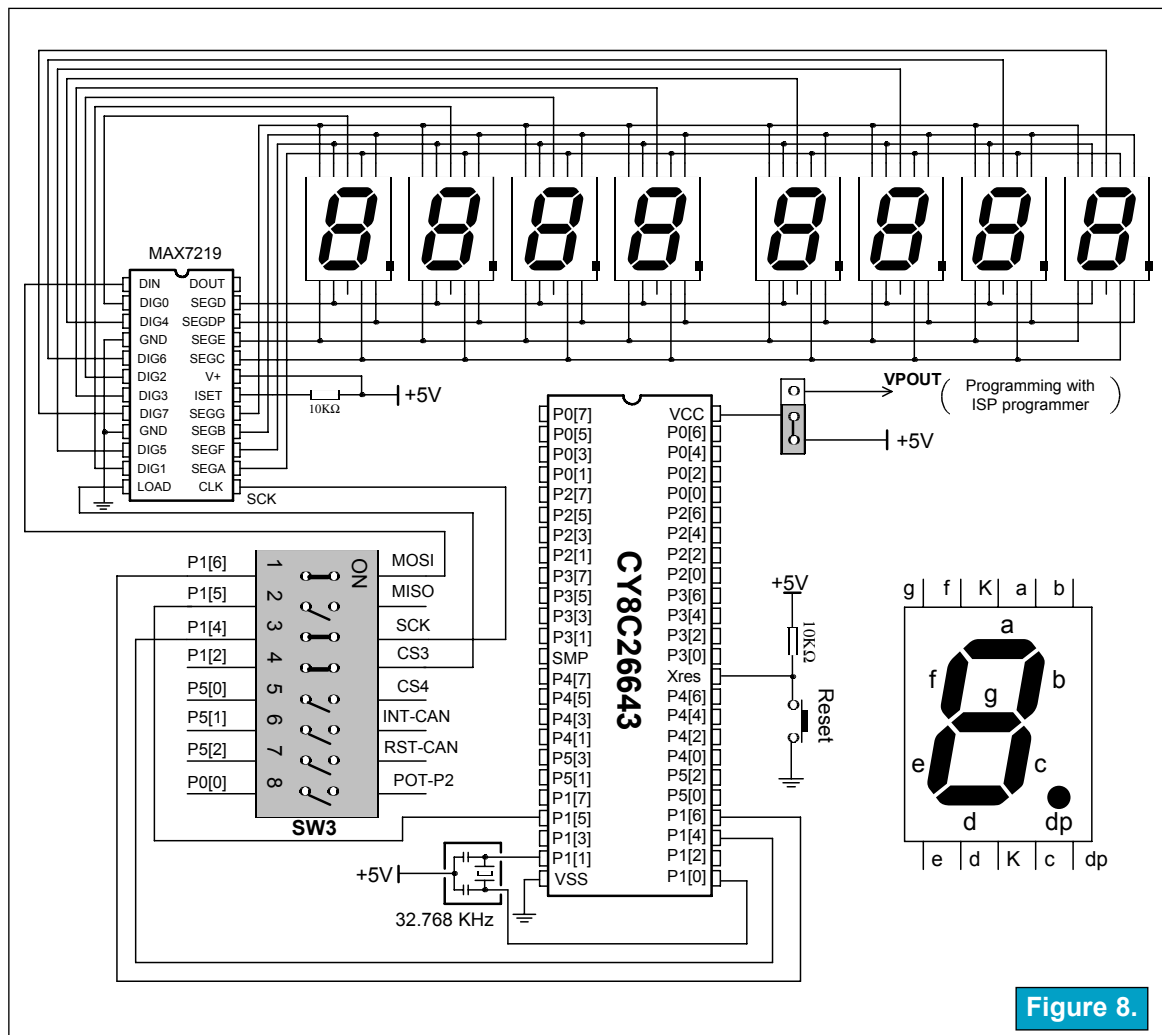
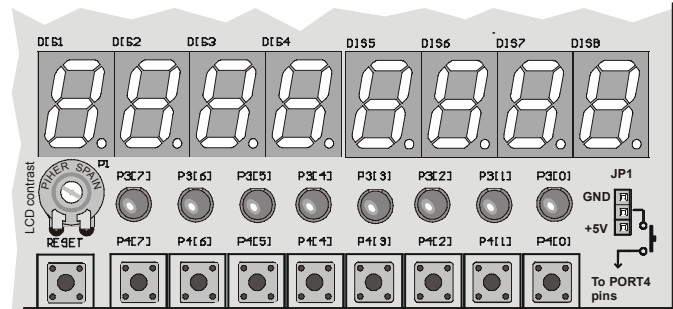


Figure 8.

ANALOG BLOCKS

PSoC controllers CY8C26643, CY8C26443, CY8C26233 and CY8C25122 contain several implemented A/D converters. Pins of port 0, as well as P2[6] and P2[7] are outputs of analog blocks, and therefore can be used for ADC, DAC and similar purpose (they are highlighted in the upper left corner of the development system). For presentation purposes, pin P0[0] can be used for reading analog voltage values determined by the potentiometer P2. In case that we want to read the value of potentiometer P2, it is necessary to set the switch Pot-P2 to ON because it connects the potentiometer directly to pin P0[0].

Switch POT-P2 is ON if potentiometer P2 is used for the presentation of A/D conversion

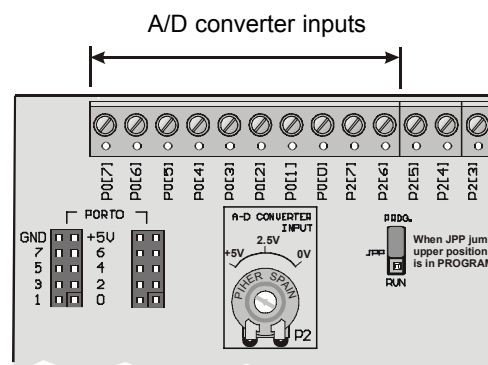
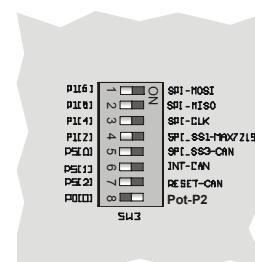
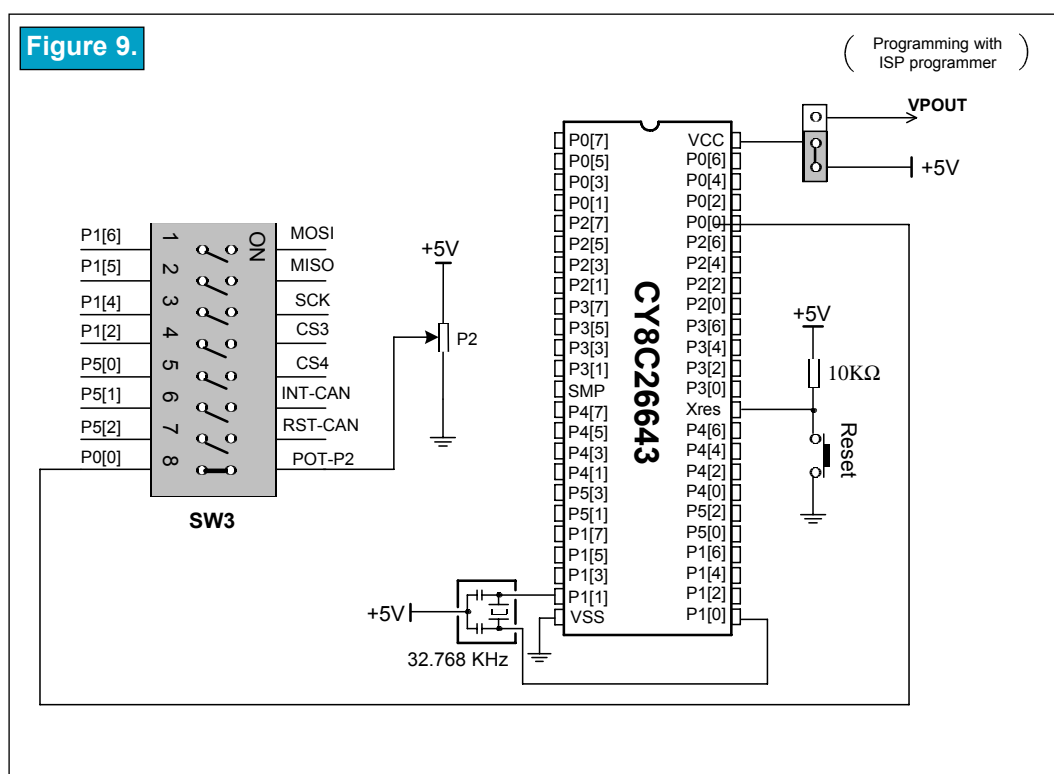


Figure 9 shows a graphic scheme of the connection between the microcontroller CY8C26643 and the potentiometer P2.



MINI SPEAKER

Figure 10 shows the switch's position and the location for the speaker, and the following figure shows how to connect the mini speaker to the microcontroller CY8C26643.



The switch Beeper (8) SW2 has to be ON when using mini speakers

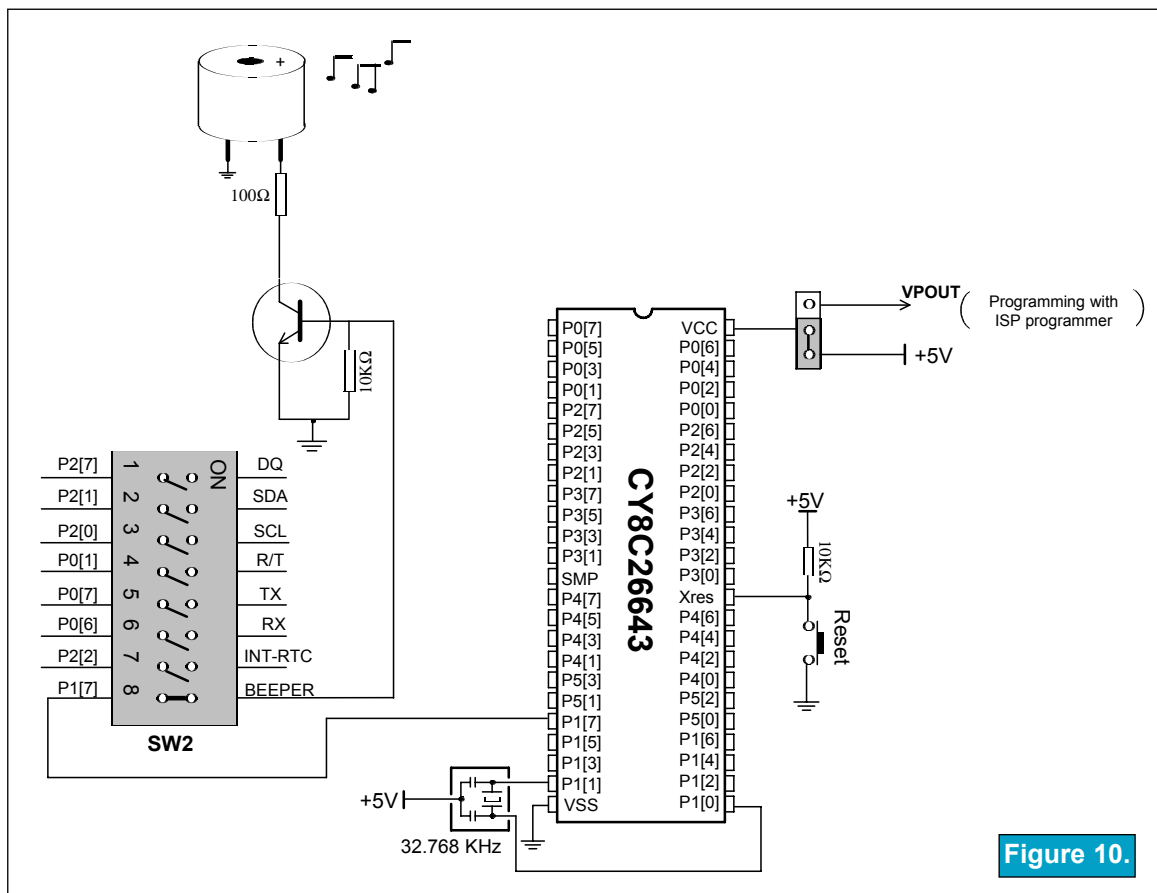
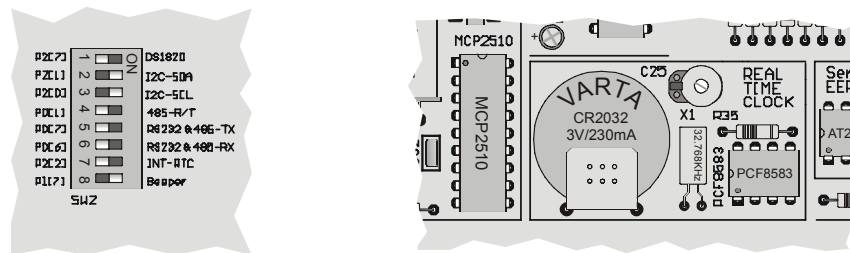


Figure 10.

REAL TIME CLOCK - PCF8583

The system features a real time clock (RTC) with battery power supply. The serial model RTC PCF8583 by Philips is used. Graphic scheme of microcontroller-RTC connection is shown on the figure 11.



SW2 switches 2, 3 and 7 have to be ON when using RTC

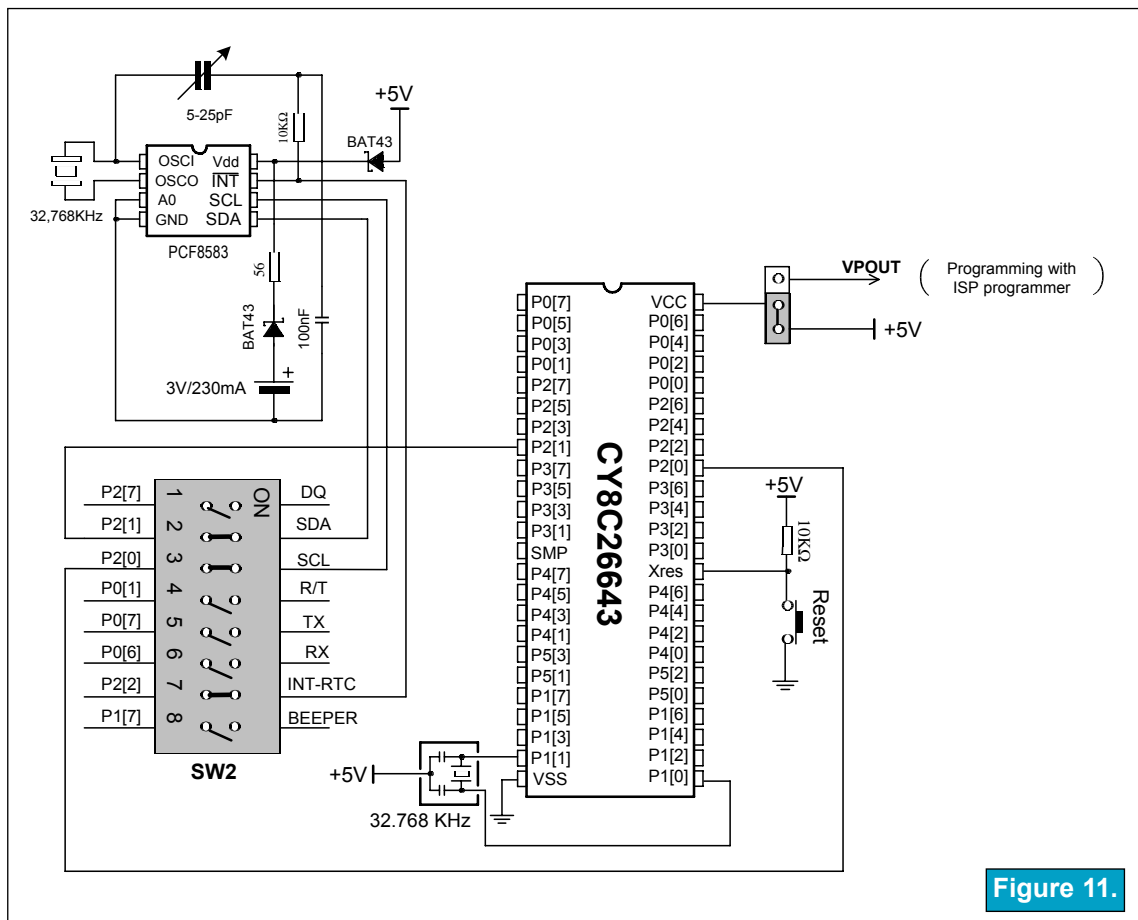
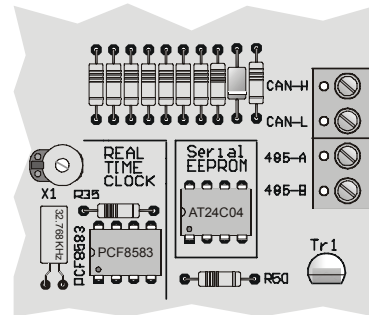
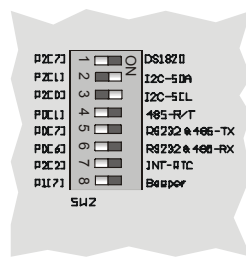


Figure 11.

SERIAL EEPROM - 24CXX

Beside the EEPROM memory standardly built in modern microcontrollers, serial EEPROM for storing data is usually added for safety reasons. Positions of **SW2** switches and the looks of EEPROM memory are shown on the following figure.



SW2 switches 2 and 3 have to be ON when using serial EEPROM

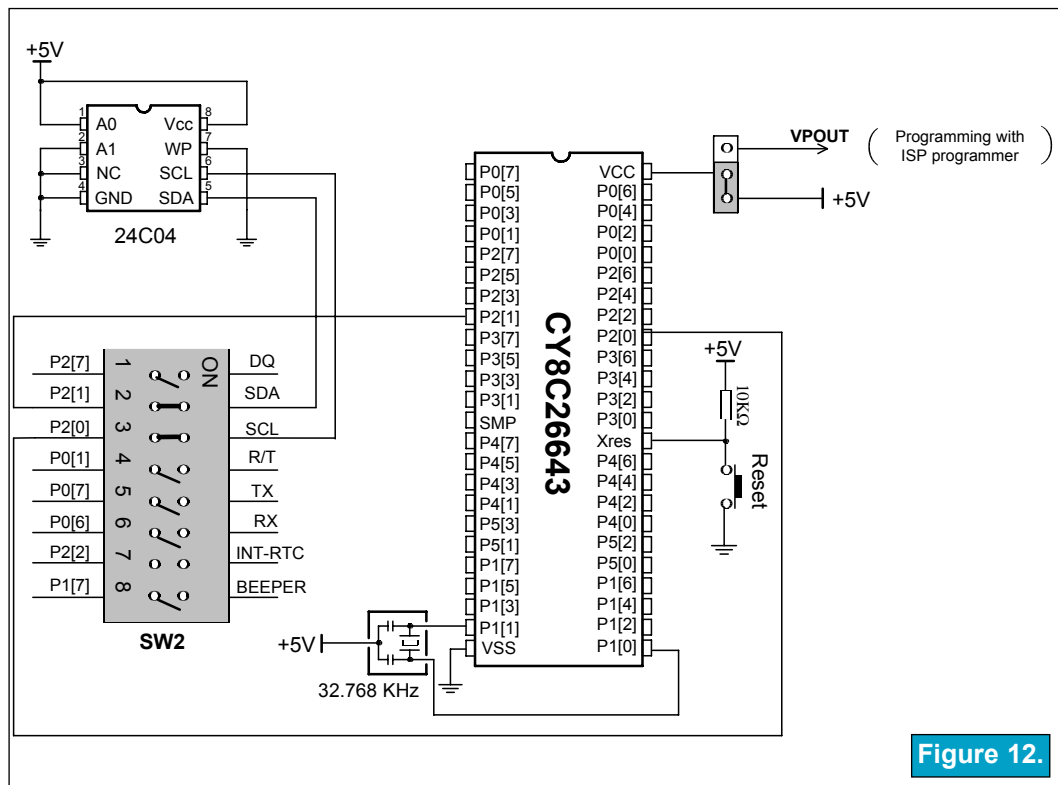
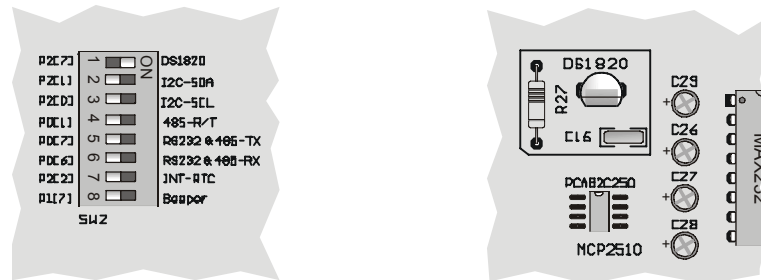


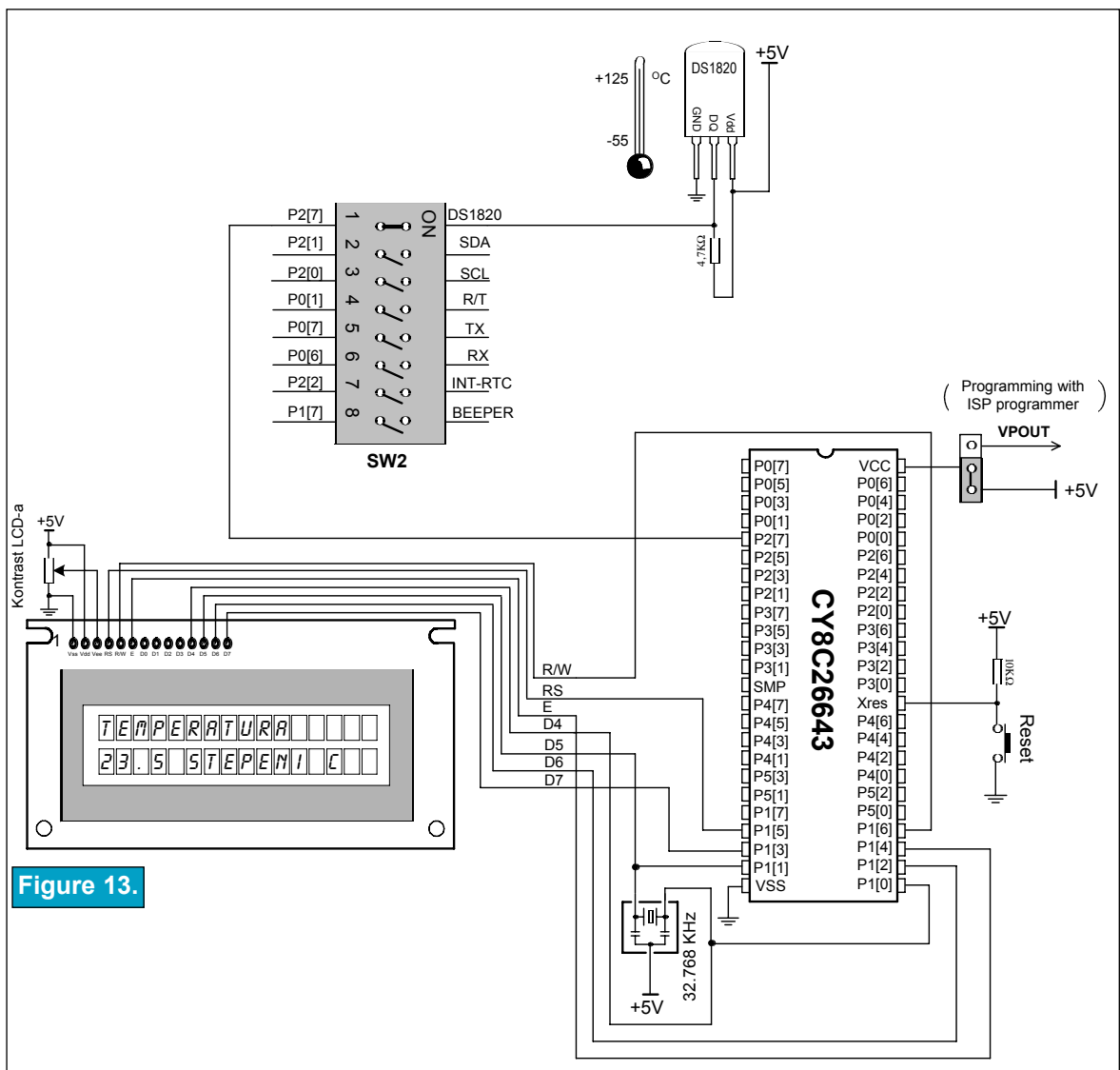
Figure 12.

DIGITAL THERMOMETER DS1820

DS1820 digital thermometer, with temperature range of -55 to 125 C, can be used for measuring environment temperature and also for experimenting. It is very accurate and easy to connect. It should be set in the 3-pin socket, beneath the power connector of the development system. Picture 13. shows how to connect digital thermometer and the microcontroller on the development system.

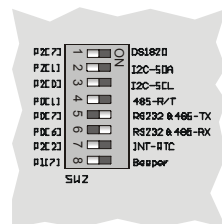


SW2 switch DS1820 (1) has to be ON when using digital thermometer



RS232 COMMUNICATION

RS232 communication is devised for connecting to one communication device, and can be used for connecting to the PC. It is commonly used for data acquisition and similar applications.



SW2 switches 5 and 6 have to be ON when using RS232 communication

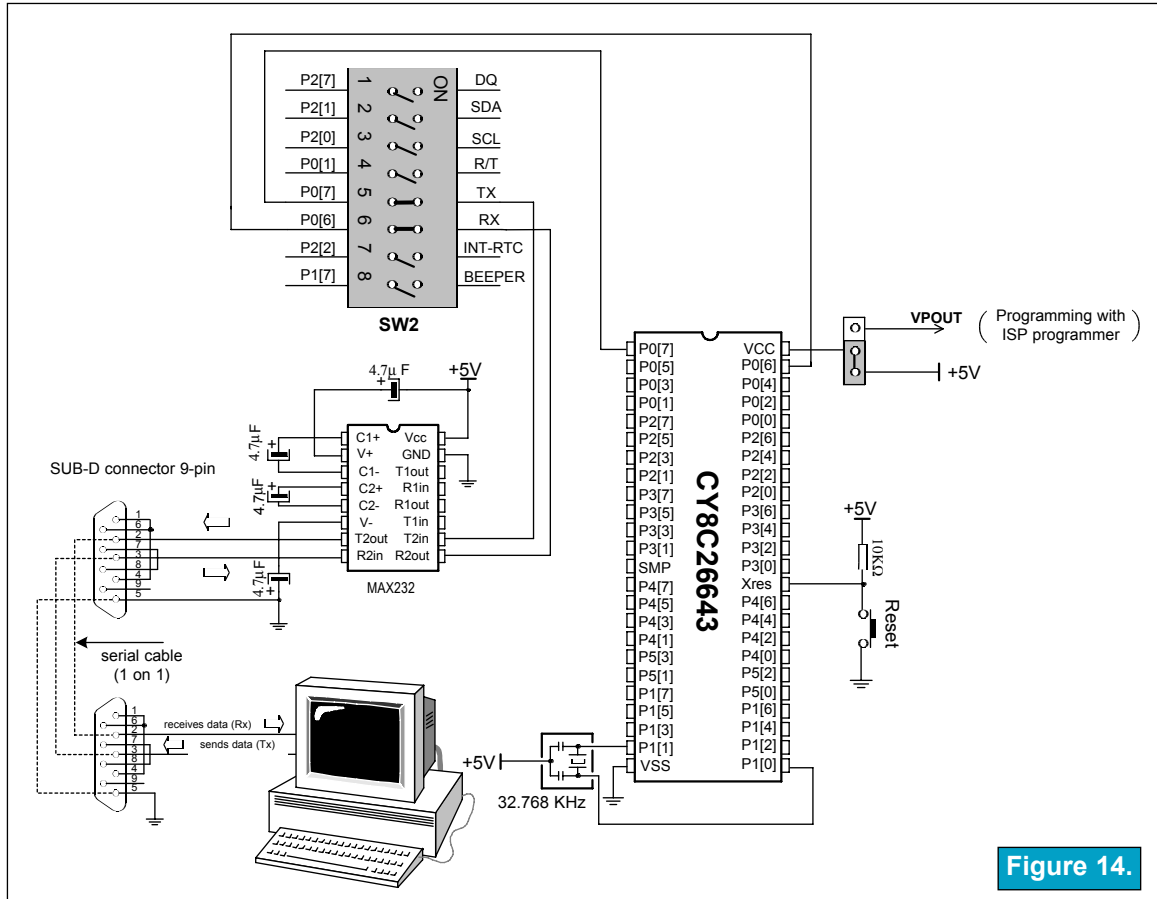
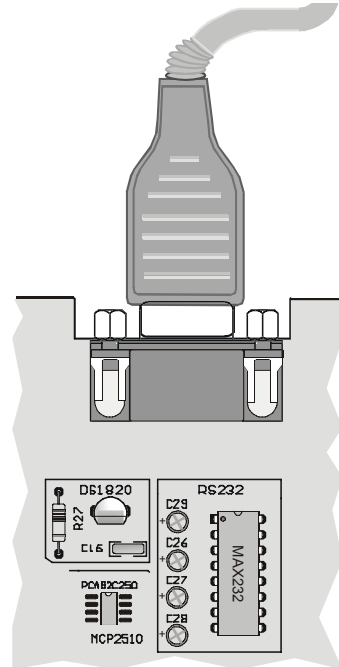


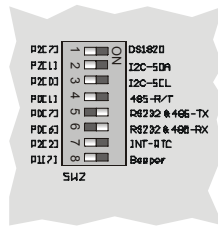
Figure 14.

RS485 COMMUNICATION

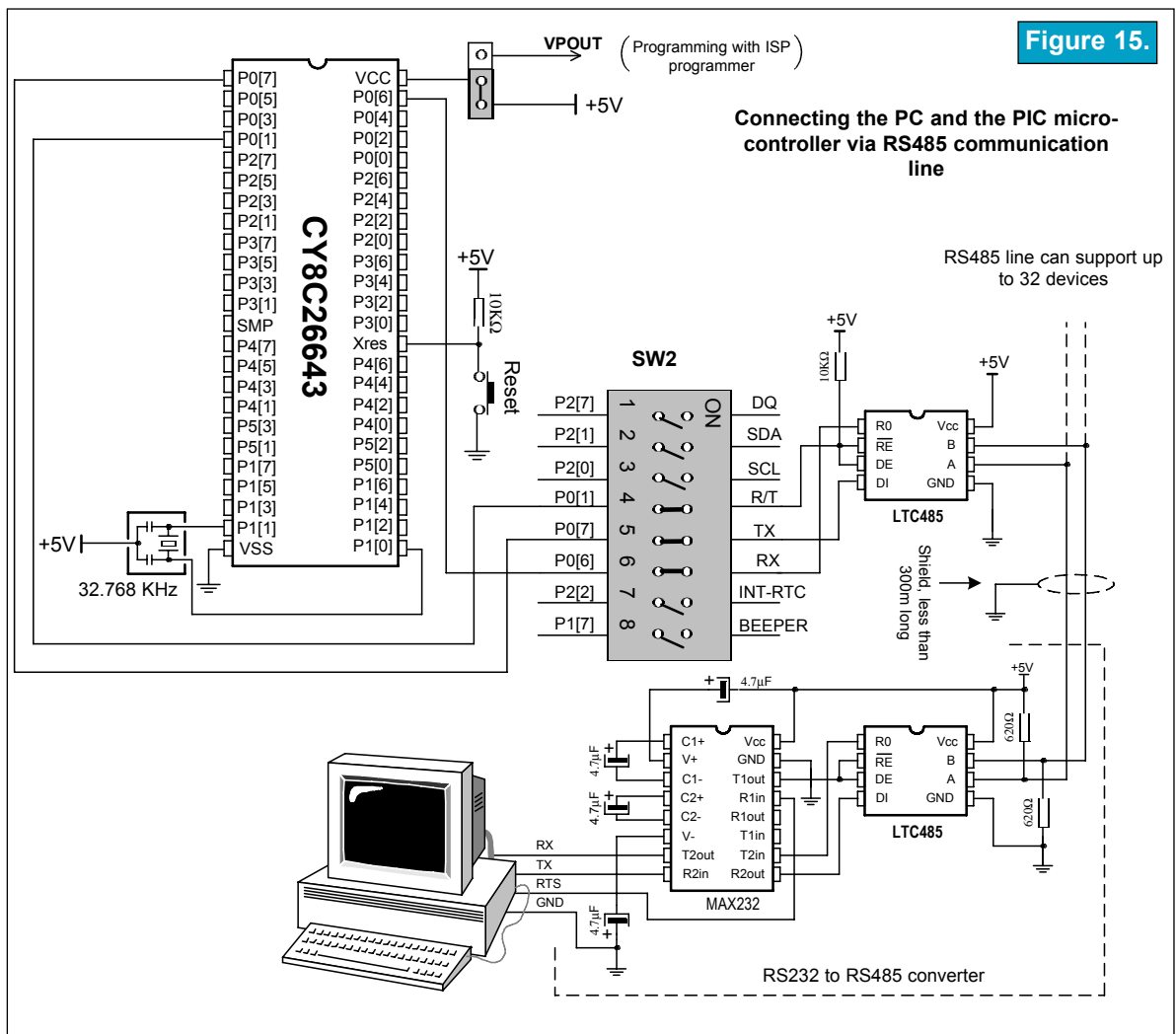
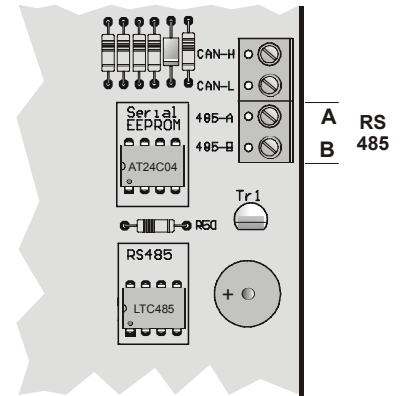
Unlike RS232, RS485 communication is used for data transfer between multiple devices. It allows one participant in communication to send and the other to receive data simultaneously. When their transfer is finished, another two users can exchange their data.

The figure 47 represents

RS485 input and the jumper settings necessary for the communication, while the figure 48 shows how to connect the PC to the microcontroller on the development system. Take care to properly connect the inputs **A** and **B** to the appropriate inputs of the master device, or else the communication will not be established.

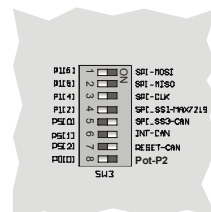


SW2 switches 5 and 6 have to be ON when using 485 communication



CAN CONTROLLER - MCP2510

This type of communication was initially intended for the auto industry, but it has proven so well that it soon found other industrial applications. It involves multiple participants like RS485 communication. Components for CAN communication are manufactured by many companies. Here we used models PCA80C250 by *Philips* and MCP2510 by *Microchip*. When using the CAN controller, **SW3** switches have to be set as shown on the following pictures.



SW3 switches 5, 6 and 7 have to be ON when using the CAN communication

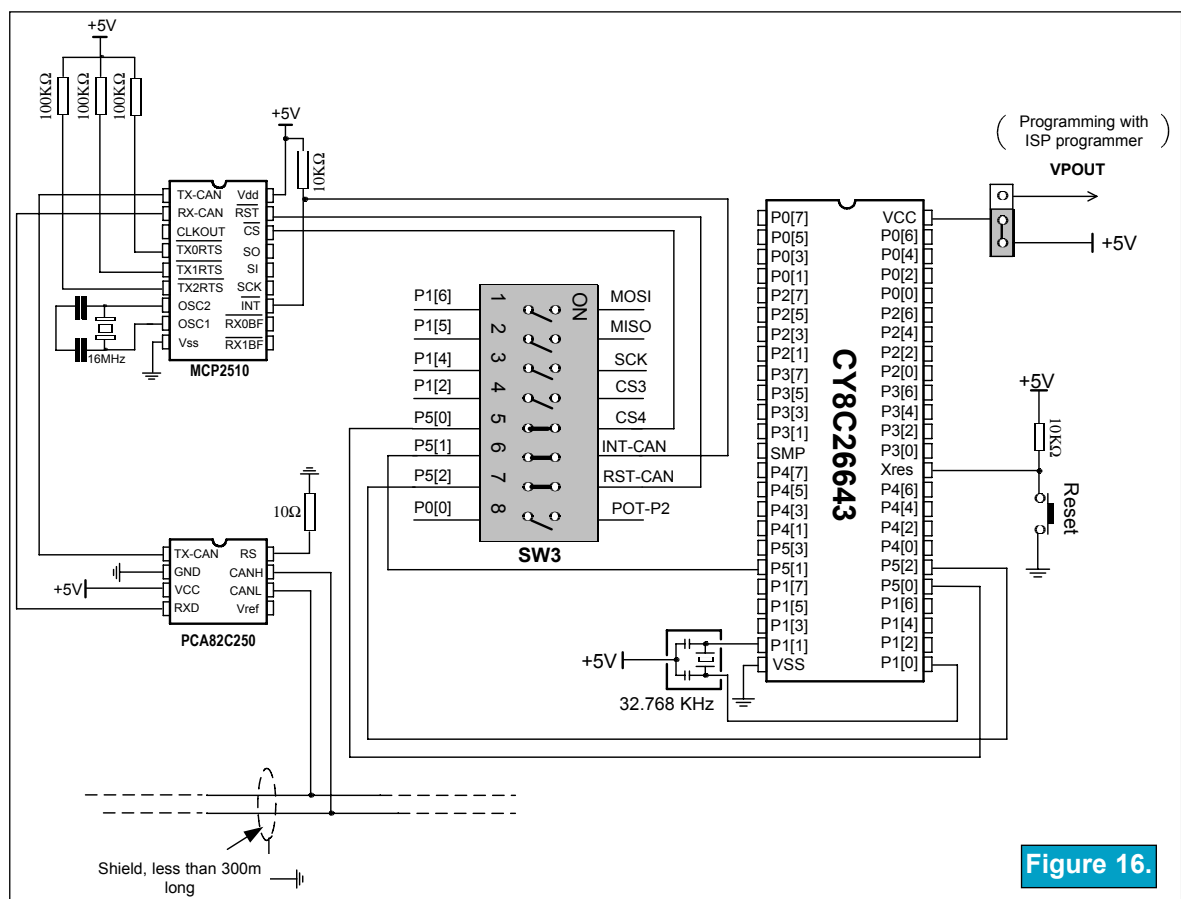
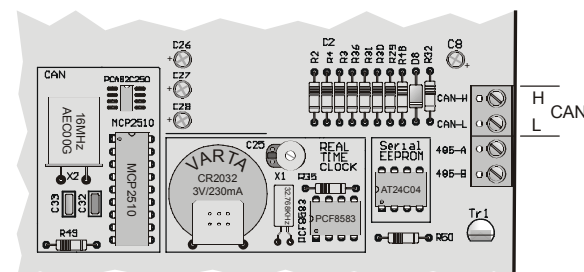
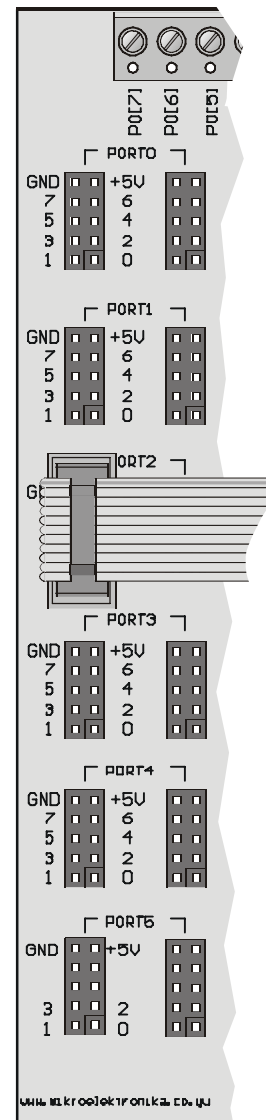


Figure 16.

DIRECT PORT ACCESS

All microcontroller pins can be used as either input or output.

Port pins can be accessed directly from the left side of the development system using the flat cable. In this way, values from external elements can be transferred via pins of appropriate ports.



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